

Spin-squeezed atomic crystal

D. Kajtoch^{1,2}, E. Witkowska², A. Sinatra²

¹Institute of Physics, PAS - Aleja Lotników 32/46, PL-02668 Warsaw, Poland.

¹Laboratoire Kastler Brossel, ENS-PSL, CNRS, UPMC-Sorbonne Université and Collège de France
Paris, France.

I will present our recent work [1] concerning a method to obtain a regular arrangement of two-level atoms in a three dimensional optical lattice with unit filling, where all the atoms share internal state coherence and metrologically useful quantum correlations. Such a spin-squeezed atomic crystal is obtained by adiabatically raising an optical lattice in an interacting two-component Bose-Einstein condensate. The scheme could be directly implemented to a microwave transition with state-of-the-art techniques and used in optical-lattice atomic clocks with bosonic atoms to strongly suppress the collisional shift and benefit from the quantum correlations at the same time.

[1] D. Kajtoch, E. Witkowska, E. Sinatra, *Spin-squeezed atomic crystal*, EPL 123, 20012 (2018).